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09/665,658	09/20/2000	Harry B. Smith	A7583	5537

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EXAMINER
JAMAL, ALEXANDER

ART UNIT	PAPER NUMBER
2643	

DATE MAILED: 07/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	09/665,658	SMITH, HARRY B.
	Examiner	Art Unit	
	Alexander Jamal	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 May 2004*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-10,21,22,26 and 28-49* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *28,40-45 and 48* is/are allowed.

6)☐ Claim(s) *1,4,8,22,26,30-36,38-39* is/are rejected.

7)☒ Claim(s) *2,3,6,7,9,10,21 and 48* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   Based upon the submitted amendments (received 5-25-04), examiner withdraws 35 USC

112 rejections from the prior office action (1-23-04) to **claims 1,36,37**.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3.   **Claims 29,37,46,47,49** rejected under 35 U.S.C. 102(b) as being anticipated by McCool

et al. (4238746).

As per **claim 29,** McCool discloses a receive system (Col 1 lines 10-29)

comprising means (the adaptive line enhancer) to receive signals across an entire

wide continuous system bandwidth. The use of multiple channels (Col 12 lines 1-9)

provides a wide system bandwidth in a 'broadband' environment (Col 1 lines 10-15).

The broadband environment is the continuous system bandwidth. The line enhancer

increases the signal to noise ratio of the system (Col 1 lines 10-29). Increasing the

signal to noise ratio inherently allows for greater system bandwidth because the

higher SNR will mean a lower error rate, and that allows for a faster data rate (higher

bandwidth, or more channels) at a given error tolerance (ie. the reception of the pulsed signals are improved). With more channels used, then broadband spectrum will provide greater noise. McCool also discloses that additional communication channels may be processed with his enhancer (Broadband) (Col 12 lines 1-9). Additionally, McCool's enhancer will process any broadband noise (Col 12 lines 10-20) rapidly. The noise is processed using the signal+noise component `X(j)' in Fig. 1. This component comprises the rapidly changing noise samples (white noise).

As per **claim 37,** McCool's system receives input signals comprising multiple spectral lines (channels) (Col 12 lines 1-8) that inherently comprise carrier signals for the purpose of transmitting the data in a known frequency range. McCool's system accepts the input signals (comprising the carrier signal), and uses the input signal to make noise estimates and then identifies a zero signal condition (when the error signal e(j) converges on the noise estimate, there will be almost zero noise signal in the data signal) which corresponds to an optimum noise estimate (the converged iterative process).

As per **claim 46,** claim rejected for the same reasons as the rejection of claim 29. The spectrum specified by McCool is a continuous broadband frequency spectrum.

As per **claim 47,** McCool's system uses an iterative processor to process data

from the received signals. An estimate of the magnitude and polarity of the noise is

determined (e(j) in Fig. 1).

As per **claim 49,** the filter 24 (McCool: Fig. 1) is a subtraction unit operable to

subtract estimated noise from the received signal.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

5.   **Claims 35,36** rejected under 35 U.S.C. 103(a) as being unpatentable over McCool

(4238746), and further in view of Golla et al. (5724395).

As per **claim 35,** McCool discloses a method to increase the signal to noise ratio in

a receive system providing a sequence of an iterative process (running the delayed input

signal through the filter and then updating the filter taps with an error signal based upon

the filter output (Fig. 1). The iterative process comprises providing a series of value

probes for each iteration (Fig 2; w 1, w2 ect..), and then deriving an equivalent noise level

(the `Xni(j)' term in Col 10, Equation 52) by summing several iterative digital values

(summation sign in Eq. 52). The cumulative sum is adjusted to be out of phase (reversed

polarity) of a noise estimate so as to cancel the noise estimate at the summing junction

(Col 11 lines 3-22). However, McCool does not disclose running two iterative processes each related to a single input signal.

Golla teaches the advantage of distributing a processing load scross multiple digital filters running in parallel to perform signal processing. He teaches that this allows multiple lower resolution filters to be used instead of a costlier single high resolution filter (Col 1 line 15 to Col 2 line 20). It would have been obvious to one of ordinary skill in the art at the time of this application that the iterative processing could have been done in parallel using multiple lower resolution filters for the advantage of saving cost.

As per **claim 36,** McCool's system receives input signals comprising multiple spectral lines (channels) (Col 12 lines 1-8) that inherently comprise carrier signals for the purpose of transmitting the data in a known frequency range. McCool's system accepts the input signals (comprising the carrier signal), and uses the input signal to make noise estimates and then identifies a zero signal condition (when the error signal $e(j)$ converges on the noise estimate, there will be almost zero noise signal in the data signal) which corresponds to an optimum noise estimate (the converged iterative process).

1.   **Claims 1,4,8,22,26,30-34, 38-39** rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. (4539689), and further in view of McCool et al. (4238746).

As per **claim 1,** Chiu discloses a method to increase the signal to noise ratio of a

receive wireline system (data modem) (Col 1, lines 12-15). The method comprises

receiving test impulse signals (ABSTRACT) on a wireline (a wireline interface is

inherent to a highspeed modem). The input signals (plus noise) are then amplified (Col 4

lines 15-19) and the signals plus noise are stored in the memory device (Col 5 lines

49-55). The method further comprises forming a matrix representing the in-phase and

quadrature versions of the received signals (Col 4 lines 35-39). However, Chiu does not

teach to estimate the magnitude and polarity of the noise portion of the received signal, or

to subtract the estimated noise value from the received signal in order to reduce the noise

on the signal. Wherein the signal comprises a continuous broadband frequency spectrum

exhibiting a reduction in overall system noise.

McCool teaches that an adaptive line enhancer can enhance signaling in a noise

field where there is poor signal to noise ratio at the input (Col 1 lines 1-17). He teaches

that to enhance received signals, the received signal and a delayed version of the received

signal (in-phase and quadrature) must be iteratively processed by adaptive filter 14 (Fig.

1), and an estimate of the noise (uncorrelated) signal produced (signal e(j) in Fig. 1). The

use of multiple channels (Col 12 lines 1-9) may provide a wide system bandwidth in a

'broadband' environment (Col 1 lines 10-15). The broadband environment has a

continuous system bandwidth. The noise (uncorrelated) signal is subtracted from the

received signal and as such, the method filters out the uncorrelated noise (Fig 1, Col 1

lines 16-20). Additionally, although McCool does show an embodiment of the adaptive

line enhancer for a narrowband signal in uncorrelated (white) noise, his use of the term

Narrowband' refers to the bandwidth of the transmitted signal in relation to the entire spectrum of frequencies 'the broadband spectrum' that may produce 'broadband noise'. His use of 'Narrowband' refers to the bandwidth of all channels being communicated. He also states that his adaptive line enhancer would be effective in a situation with multiple non-interfering spectral lines ('channels' in a 'broadband' signal; with 'broadband' referring to the modern day definition of multiplexing and transporting multiple channels) in correlated noise (Col 12 lines 1-8). It would have been obvious to one of ordinary skill in the art at the time of this application to increase the signal to noise ratio of the wireline receiver by iteratively processing the in-phase and quadrature versions of the received signal to produce a noise estimate which is subtracted from the received signal, thereby producing a noise-reduced signal and reducing the overall system noise.

As per **claim 4,** McCool's processing step comprises a number of value probes which alter the received signal iteratively (Fig 2; w1, w2 ect..). The step further comprises producing an estimate of the noise (uncorrelated) signal (e(j)) in Fig. 1) is given by summing the resultant values of several iterative steps.(Col 9 lines 45-60).

As per **claim 8,** Chiu's method comprises providing processing means that do not adversely compromise the bandwidth and signal handling capabilities of the system by performing the processing on an impulse sent before the data (Col 2 lines 16-23). The time delay for processing is short (Col 2 lines 24-28). The short time delay is utilized to setup the system such that the received signal is increased and the received noise is reduced, as such, the signal-to-noise is inherently improved.

As per **claim 22,** Chiu's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 2 lines 16-23). McCool's method comprises subtracting a noise (uncorrelated) signal estimate from the received signal (Fig 1, Col 1 lines 1620). The fact that reducing the noise of a received signal is analogous to an introduction of energy at a lower temperature in a thermal system and improves the effective entropy with each trial, in inherent to the fact that noise is being taken from the system.

As per **claim 26,** McCool's method enhances the received signal by enabling a stronger signal relative to noise by removing the uncorrelated noise signal (Col 1 lines 16-20). The fact that the method provides for longer communication distance and/or quicker access time potential is inherent in the fact that the noise of the received signal has been reduced.

As per **claims 30,31,** McCool's method selects one set of values such that the error term e(j) (is closest to the noise estimate) (Col 11 lines 10-25). When e(j) has converged to the noise, then the noise in the input signal is minimized and the largest signal to noise improvement is achieved. McCool's method estimates the noise portion (e(j)) of a received signal. This Includes all cycles of any carrier signals (the carrier signal is disclosed in Chiu: Col 3 lines 49-57). McCool's method reduces noise in the signal based upon the selected probes (filter taps). Any signal input into McCool's system (including the modulated signal disclosed in Chiu: Col 3 lines 49-57) will be noise reduced, and as such, the demodulated result signal will be formed based upon the noise reduction (which is based upon the selected probes).

As per **claims 32,33,** McCool's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 1 lines 54-64). The process would be performed on every cycle (all cycles) of a carrier signal (The carrier signal is disclosed in Chiu: Col 3 lines 49-57). The device also adjusts the phase (modulates) the time-delayed signal iteratively such that the delayed signal is in phase with the non-delayed signal, thus the process is performed in substantially real time. The modulation is inherently achieved such that the Nyquist criterion is satisfied for the purpose of being able to successfully recover the original data.

As per **claim 34,** McCool's iterative process is performed in a digital filter. As such the process on each cycle is inherently performed on stored samples for the reason that the samples must be stored in order to be digitally processed.

As per **claim 38,** McCool's method comprises implementing a method of near-real time processing by providing for a fixed time delay (Col 1 lines 5464) with respect to a zero phase reference (the undelayed signal). The process would be performed on every cycle (all cycles) of a carrier signal (The use of a carrier signal to transport the data is disclosed in Chiu: Col 3 lines 49-57).

As per **claim 39,** in McCool's method, the noise estimate is obtained from every complete cycle of a carrier signal (The use of a carrier signal to transport the data is disclosed in Chiu: Col 3 lines 49-57). The data is sent in pulses (inherent to the definition of digital data). The signal (comprising `carrier' and `data') received by the system inherently corresponds to the demodulated `data' (absence of `carrier') for the reason that both signals have the `data' in common. In McCool's method the noise is reduced to a

residual value which inherently provides and enhances the ability to detect the data pulses

(Col 11 lines 45-56).

Allowable Subject Matter

2. **Claims 2,3,6,7,9,10,21,48 are objected to as being dependent upon a rejected base claim,**

but would be allowable if rewritten in independent form including all of the limitations of

the base claim and any intervening claims.

3. **Claims 28,40-45 are allowed over the prior art of record**

Response to Arguments

4. Applicant's arguments with respect to claims 1,4,29,35,37,46 (and all depending claims)

have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicant's use of 'narrowband' and 'wideband' ('broadband'). The

applicant provides no definition of either term, nor a range of frequencies or number of

channels or specific data rate in the submitted specification. The examiner is relying

upon the accepted and well known definitions as follows (from Merriam-Webster's

Online Dictionary, 10th Edition):

Broadband: of, relating to, or being a communications network in which a frequency

range is divided into multiple independent channels for simultaneous transmission of

signals (as voice, data, or video)

Narrowband: operating at, responsive to, or including a narrow range of frequencies

Wideband: broadband

McCool discloses a receiver that may receive multiple narrowband channels (Col 12

lines 1-9) across a broadband noise spectrum (Col 1 lines 10-15). The multiple

narrowband signals comprise a broadband signal. McCool does not specify which

particular frequencies the channels are located at, as such they may be located anywhere

in the broadband spectrum and may be processed by the receiver. The adaptive filter

converges to act as a series of narrowband filters by filtering out noise outside the

narrowband frequency ranges. Again, the channels are passed but the noise in and

outside the channel is filtered. The set of narrowband channels (and the noise between

them) comprise a broadband signal. There is no limitation on what frequencies the

channels reside at, as such McCool's system could receive signals (and subtract noise)

from anywhere across an 'entire wide continuous spectrum'.

Regarding applicant's argument on the rejection of claim 35. Please refer to the new

103 rejection using an additional reference (above).

Regarding applicant's argument about the prior art disclosing an 'iterative process that converges to an estimate of the magnitude and polarity of the noise portion', McCool does disclose that value in the signal $e(j)$ (Fig. 1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9315 for After Final communications.

AJ
July 15, 2004

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